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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/017,325 | 12/14/2001 | Tomohiko Shibata | 782_206 | 8198 |
| 25191 | 7590 | 09/09/2004 | EXAMINER | |
| Burr & Brown PO BOX 7068 SYRACUSE, NY 13261-7068 | | | IM, JUNGHWA M | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2811 | |

DATE MAILED: 09/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/017,325

Applicant(s)

SHIBATA ET AL.

Examiner

Junghwa M. Im

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6,8 and 10-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,8 and 10-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-6, 8 and 10-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohba (US 5990495) in view of Ogawa et al. (US 6455877), hereinafter Ogawa.

Regarding claims 1 and 11-13, Fig. 6 of Ohba shows a light-emitting semiconductor device comprising:

a sapphire substrate (10);

an AlN(Ga) layer (11) on the substrate with a thickness of 30 nm-500 nm (col. 8, line 23) comprising a semiconductor nitride, the crystallinity of the AlN(Ga) being set to have full width at half maximum X-ray rocking curve value of 90 seconds or below (Abstract);

a semiconductor layer group (12, 13, 14, 15, 16) on the AlN(Ga) layer comprising a semiconductor nitride including at least Ga, and being independent from the AlN(Ga) layer, wherein the Al content of the semiconductor nitride (in an AlGaN layer; 13) set smaller than that of the first semiconductor nitride (col. 6, lines 46-50).

Ohba shows the most aspect of the pending claim except “a buffer layer on the under layer comprising a second semiconductor nitride”, and “the thickness of the buffer layer is set within 0.002-0.1 um.”

Ogawa discloses a semiconductor device wherein a GaN buffer layer with a thickness of 20 nm (col. 8, lines 47-48) grown on the underlayer having a thickness of 3 μ m (col. 8, lines 38-39). See the respective portions in col. 8, lines 36-62.

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Ogawa into the device of Ohba in order to have a GaN layer on the underlayer of AlN(Ga) with a recited thickness to have a good surface condition.

Regarding claim 2, the combined teachings of Ohba and Ogawa do not explicitly disclose that Ga content of the second semiconductor nitride is set not more than that of the third semiconductor nitride. However, it would have been obvious to have Ga content of the second semiconductor nitride set not more than that of the third semiconductor nitride with Ohba's teaching. Ohba discloses, starting on col. 11, line 39, that compositions of the layer formed on the underlayer(buffer layer) can be arbitrary, especially teaching that AlGaInN layer (the same composition of the instant invention) on the underlayer (buffer layer) minimizing the crystal defect (col. 11, line 65-col. 112 line 3).

Regarding claims 3 and 4, it is obvious that Al content of the first semiconductor nitride in the device of Ohba and Ogawa is set 50 atomic percentages or over since the AlN layer of Ohba has the same elements to that of the instant invention while showing the same characteristics in FWHM of X-ray curve.

Regarding claims 5 and 6, Ohba teaches wherein the AlN layer is formed at least 1100°C by a MOCVD method (col. 3, lines 54-68). In addition, "MOCVD" is a process designation, and would thus not carry patentable weight in this claim drawn to a product. See *In re Thorp*, 227 USPQ 964 (Fed. Cir. 1985).

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Regarding claim 8, Ohba discloses the nitrogen gas introduction into the surface of the substrate, thus indicating a surface nitride layer, to grow the buffer layer (Applicant's underlayer) with the treatment preventing the dissociation of the nitrogen atoms from the crystal implying the nitride formation on the surface of the substrate. Ogawa also discloses the substrate is made of sapphire single crystal and the underlayer is formed on the main surface of the substrate via a surface nitride layer formed at the main surface (col. 8, lines 37-45).

Regarding claim 10, Fig. 2 of Ohba shows gradual reduction of Al content.

Regarding claim 14, Ogawa shows the thickness of the buffer layer (20 nm) is smaller than the thickness of the underlayer (3 μm) and the thickness of the semiconductor group (5 μm for the layer 12 alone).

Regarding claim 15, Ogawa shows the thickness of the underlayer (3 μm) is greater than 0.5 μm and equal to or less than 1000 μm .

Response to Arguments

Applicant's arguments with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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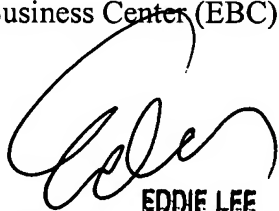
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jmi



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